

Algebraic Combinatorics meets Inverse Systems
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Degeneration methods, an interface between AG, RT and CO

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Abstract

My talk will center around the theme that geometric degeneration can be a useful means to connect seemingly disparate ideas from algebraic geometry, representation theory and combinatorics.

In particular, I will relate a classical algebro-degeneration technique, dating at least to [Hodge, 1941], to the notion of vertex decompositions of simplicial complexes introduced by [Billera-Provan, 1979]. The good case is when this degeneration is reduced, and we call this a “geometric vertex decomposition”. In joint work with Allen Knutson and Ezra Miller, we developed generalities about this analogy, and applied what we learned to the study of certain Schubert determinantal ideals.

I will survey this work, and mention subsequently discovered applications, e.g., in connection to: matroid theory (Nick Proudfoot and David Speyer), the scheme of commuting matrices and statistical mechanics (Allen Knutson and Paul Zinn-Justin) and Littlewood-Richardson rules (joint with Allen Knutson).